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# Colorado River Salinity Control Program
# Federal Accomplishments Report for Fiscal Year 2001

Presented to

## Colorado River Basin Salinity Control Advisory Council

by

Department of Agriculture
Environmental Protection Agency
Fish and Wildlife Service
Geological Survey
Bureau of Land Management
Bureau of Reclamation

October 2001

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This report informally compiles the verbal reports of the participating federal agencies into a written text for the Advisory Council review during their annual meetings. Due to the date of the Advisory Council meeting falling near the end of the fiscal year, many of the figures and claims shown in this report are subject to minor revisions.

Additional information and official reports about the Colorado River Basin Salinity Control Program may be found at:

http://www.uc.usbr.gov/progact/salinity/index.html

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# Department of Agriculture
# Colorado River Basin Salinity Control Program
# Accomplishments for Fiscal Year 2001

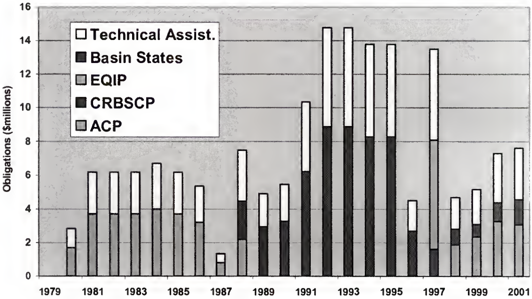
The Environmental Quality Incentives Program (EQIP) authorized by Congress in 1996 provides funding for the U.S. Department of Agriculture (USDA) to conduct current Colorado River Basin salinity control activities. The Natural Resources Conservation Service (NRCS), the Farm Service Agency (FSA) and the Cooperative State Research, Education and the Extension Service (CSREES) each administer various components of EQIP to deliver Colorado River Basin salinity control funding and services to rural landowners and operators, tribes or other groups.

In fiscal year 2001, $5.8 million was allocated to salinity control activities from USDA's EQIP. These funds were used to share the cost with landowners and operators to install conservation systems that include salinity control and wildlife habitat replacement. EQIP also provided funding to allow the NRCS and the CSREES to deliver technical and educational assistance to clients. Accelerated technical assistance was included to employ a NRCS basin salinity coordinator who serves as liaison between the USDA and the United States Department of Interior Bureau of Reclamation (BOR) programs and is located in the Reclamation's Upper Colorado Regional Office in Salt Lake City, Utah.

## Status of Implementation

Currently, USDA is providing technical and financial assistance to landowners and operators to implement on-farm salinity control measures in six project areas: the Unita Basin and Uinta Basin Expansion and the Price-San Rafael Rivers Unit in Utah; the Grand Valley, Lower Gunnison River Basin, and McElmo Creek Projects in Colorado; and the Big Sandy River Unit in Wyoming.

Progress in implementing the various projects is controlled primarily by annual appropriations. From 1987 through 1995, the Colorado River Basin Salinity Control Program (CRBSCP) received dedicated annual funding. The Agricultural Conservation Program (ACP) administered by the Agricultural Stabilization and Conservation Service (ASCS) provided cost-share assistance to land users through long-term agreements. Technical assistance to land users was provided by the Soil Conservation Service. In 1995, Public Law 103-354 authorized the reorganization of several agencies of USDA. The ASCS was reorganized as the Farm Service Agency (FSA). The SCS was reorganized as the Natural Resources Conservation Service (NRCS). Financial administration of the CRBSCP was transferred to the new NRCS.


**USDA Salinity Allocations**

The Federal Agricultural Improvement and Reform Act (FAIRA) of 1996 (Public Law 104-127) combined four existing programs including the CRBSCP into the newly authorized Environmental Quality Incentives Program (EQIP). In fiscal year 1997, Reclamation began on-farm cost sharing from the Basin States funds that would parallel and supplement EQIP. For every $1 of USDA funds allocated to salinity control in the authorized project areas, approximately 43 cents is made available from Reclamation's Basin States account for on-farm financial and technical assistance.

## Grand Valley, Colorado

Implementation has been underway in this unit since 1979. The application of salinity control and wildlife habitat replacement practices continues. Farmers are installing underground pipelines, gated pipe, concrete lined ditches, land leveling, and a variety of other practices.

The installation of surge irrigation systems continues to increase. The surge units provide the participants with the capability of performing fertigation, which involves applying liquid nitrogen fertilizer during the soak stage of irrigation. Acceptance of this practice is an additional incentive for farmers to install surge systems. Nearly 28,000 acres of the goaled 53,000 acres (52%) are under contract for salinity measures.

**Lower Gunnison Basin, Colorado**

This is the largest of the USDA salinity control units and is located in Delta and Montrose counties. Implementation was initiated in 1988 in this unit.

The application of salinity reduction and wildlife habitat replacement practices continue to be an integral part of the implementation of Lower Gunnison unit. The major practices are underground pipelines, ditch lining, land leveling, irrigation water control structures, gated pipe, sprinkler and surge irrigation system. Nearly 70,000 acres of the goaled 135,000 acres (52%) are under contract for salinity measures.

**McElmo Creek, Colorado**

Implementation was initiated in this unit in 1990. Application of salinity reduction and wildlife habitat replacement practices continue to be implemented in this area with sprinkler systems, underground pipelines, and gated pipe being installed.

Development and use of automatic shutoff valves for sprinkler systems continue to be widely implemented in the project to achieve water management. This project planned to install predominantly sprinkler systems with a small number of improved irrigation systems. Over 96% of the goaled 21,500 acres have been contracted but currently only 35% of the salt reduction goal has been reached.

**Uinta Basin, Utah**

Implementation began in this unit in 1980. The rate of applying salinity reduction and wildlife habitat replacement practices continues to increase. The major practices installed are sprinkler irrigation systems, improved surface systems, underground pipelines and gated pipe. In this area, a large number of groups are replacing earthen laterals with pipelines to provide gravity pressure for onfarm sprinkler systems.

Demonstration plot activities continued on Ute Indian Tribal land to: illustrate the benefits of sprinkler irrigation; teach principles of irrigation scheduling; and provide data on crop variations, yields, and costs to determine fair market lease agreements. Special emphasis is being placed on working with individual farmers on principles of irrigation water management. Over 102,000 acres (75%) of the goaled 137,000 acres have been contracted.

**Price-San Rafael, Utah**

The Bureau of Reclamation and USDA continued implementation of salinity control practices in the project area in fiscal year 2001. Underground pipelines are being installed by the Bureau of Reclamation to deliver water to the participating farms. The major practices being done onfarm by USDA are sprinkler irrigation systems and gated pipelines. Approximately 6,500 acres of the goaled 36,050 acres (18%) have been contracted.

**Big Sandy River, Wyoming**

Implementation has been underway in this unit since 1988. The application of salinity reduction and wildlife habitat replacement practices continues to be implemented. In this area, farmers are converting from surface flood irrigation to primarily low-pressure center pivot irrigation systems for salinity control. Over 13,000 acres of the planned 15,700 acres have been contracted (84%).

## Planning and Investigations

Evaluations are completed or underway for potential projects in the Mancos River area of Colorado, the western Green River area of Wyoming, the Virgin River Valley of Utah, Nevada, and Arizona and the San Juan Basin of New Mexico.

**Mancos, Colorado**

The potential for salinity control measures was investigated and summarized in the 1984 USDA report "Mancos Valley Salinity Control Study." Since that time, increased sponsor interest, the integration of USDA and Reclamation projects, and more cost effective measures point toward a greater likelihood for a successful and economically viable project. Investigations are being conducted to determine salt loading, pipe routing, and overall costs for project implementation. Considerable public support was demonstrated at an informational meeting held in Mancos in June 2001. An application has been tendered for an EQIP geographic priority area designation with associated funding.

**West Green River Area, Wyoming**

In 1999, a study of salinity sources was initiated in the Henry's Fork, Black's Fork, Smith's Fork, Ham's Fork and Muddy Creek tributaries of the western drainages of the Green River above Flaming Gorge Reservoir. A final report will be released in late 2001. Although salt loading occurs from irrigation practices in these drainages, salinity control opportunities are not cost effective when compared to other existing salinity control project areas.

**Potential Projects in Utah**

A reconnaissance conducted in 2001 in the Fremont River drainage between Torrey and Hanksville, Utah, indicate that, even though salt loading rates are fairly high in some agricultural fields, replacing long earthen ditches which only supply small acreages would not be cost effective. The potential exists to implement salinity control in the area near Manila, Utah. Investigations are planned for 2002.

## Monitoring and Evaluation

Monitoring and evaluation activities continue on a limited basis in the project areas as EQIP provides significant less funding for technical assistance than did the original Colorado River Salinity Control Program. NRCS, in association with the Cooperative Extension Service in each state, monitors the effects of the on-farm installation and operation of salinity control practices on salt load reductions and wildlife habitat. Some data is collected and analyzed to characterize the economic impact of the salinity control program. Independent reviews of the monitoring and evaluation programs indicate that more attention should be given to determining the state and condition of previously installed systems and how operation of the bulk of the systems affects salinity control basin-wide.

### Concluding Comments

Requests from farmers and ranchers for financial and technical assistance continue to exceed available resources. Approximately one half of the basin-wide salt control goal has been obtained. Many of the earliest systems are nearing the end of their planned and useful life. Replacement of these ageing systems has been estimated to cost nearly $30 million annually. This amount would be in addition to the cost of the current program.

# Environmental Protection Agency
# Colorado River Basin Salinity Control Program
# Accomplishments for Fiscal Year 2001

During FY-01, EPA assistance to the Colorado River Salinity Control Forum (Forum) involved the following activities:

**View of Dead Horse Point in Canyon Lands National Park near Moab, Utah - Overlooking potash evaporation ponds near Colorado River (photo by Doug Johnson, EPA).**

- The EPA presented several informational updates to the Forum, the Advisory Council and the Technical Workgroups. These included: (1) EPA Region 8 worked with Region 9 EPA Office in San Francisco and Region 6 EPA Office in Dallas to prepare it's statement of existence, reference to EPA's website and status on EPA international boundary water program expenditures for the Forum and the Advisory Council during the Advisory Council meeting in November 2000, (2) EPA presented a preliminary briefing to the Advisory Council and Forum on Western States Coal Bed Methane development and environmental issues of concern, and (3) EPA's updates included timely information on the previous Administration's efforts to pass key proposed regulatory programs including Proposed Tribal Core Water Quality Standards Regulations and the Proposed New Total Maximum Daily Load (TMDL) Regulation, currently delayed until CY 2002.

- EPA provided information to Executive Director, Jack Barnett, on the Non Point Source Clean Water Act, Section 319 funding process and Region 8 "One Stop" Grant programs which resulted in funding of the Bear River Commission, Three-state water quality standards project and TMDL efforts. EPA has added the Forum to the Region 8 grant database for notification and request for proposals on next year's "Consolidated Funding Process" grant program.

- EPA continued to work with Reclamation and USGS to better understand influences of the Paradox well on earthquakes and suggest ways to improve the effectiveness of the project.

- EPA worked with Forum to better understand the history behind NPDES concerns raised by Forum in previous years and revisited in spring of 2001.

# Fish and Wildlife Service
# Colorado River Basin Salinity Control Program
# Accomplishments for Fiscal Year 2001

The Fish and Wildlife Service (Service) attended scheduled Work Group and Forum meetings throughout the year. In addition, the Service attended several supplemental meetings to discuss the status of compensation for wildlife resource values foregone, effectiveness of practices implemented for wildlife compensation, and difficulties in achieving appropriate and sufficient wildlife compensation. These discussions were prompted by recognition that effective fulfillment of Salinity Control Program goals is being impeded by delays and difficulties in achieving concurrent and commensurate compensation for fish and wildlife impacts.

Pursuant to the National Environmental Policy Act, Fish and Wildlife Coordination Act, Clean Water Act, and Endangered Species Act, the Service evaluated and provided comments on fish and wildlife impacts and mitigation requirements on reports and permit applications for specific projects and programs. The Service also engaged in lengthy discussions with both action and partner agencies about project design, effective practices, longevity and maintenance of implemented practices, and effects of land use changes on already completed wildlife compensation projects. During the coming year, the Service will work with these agencies to develop guidance and procedures to help address some of the concerns raised during discussions on these topics.

The appointment of a coordinator for Natural Resources Conservation Service (NRCS) Salinity Programs, as well as designation of a replacement Service representative to the Salinity Control Program Work Group, has provided an opportunity for the Service to work more closely with both NRCS and the Bureau of Reclamation (BOR) to evaluate and implement wildlife components of salinity control projects. This coming year, the Service plans to work with NRCS to revise the wildlife section of the Monitoring and Evaluation Reports to make them easier to prepare and more useful as documents to guide priorities and evaluate progress. Additionally, the Service plans to work closely with both NRCS and BOR to devise strategies for overcoming difficulties in planning and implementing wildlife compensation projects. Finally, the Service plans to work more closely with BOR and NRCS staff biologists to design, implement, and evaluate wildlife projects so that they are as appropriate, valuable, and cost-effective as possible in achieving compensation. Included will be efforts to facilitate more communication and mutual education among biologists from the various Salinity Control Program areas so each can learn from the strategies and techniques of others.

The Service anticipates a higher level of involvement during fiscal year 2002 than in previous years. This involvement will focus on: (1) working with BOR on evaluating past and currently proposed wildlife compensation approaches and their appropriateness for different Salinity Control Program areas; (2) working with NRCS to develop strategies to improve progress in achieving on-farm wildlife compensation; (3) working with NRCS to improve quality and effectiveness of on-farm wildlife compensation; and (4) working with both agencies to improve evaluation and reporting of wildlife compensation.

# United States Geological Survey
# Colorado River Basin Salinity Control Program
# Accomplishments for Fiscal Year 2001

## Colorado

### Salinity Control/Selenium Remediation - Uncompahgre Demonstration Project

In 1998-99, 8.5 miles of open-ditch irrigation laterals were replaced with 7.5 miles of pipe in the Montrose Arroyo Basin in the Uncompahgre Valley southeast of Montrose. This project had the dual objectives of reducing salt loading to the Colorado River and reducing selenium loading to streams in the area for the benefit of fish and wildlife. The Colorado River Salinity Control Program and the National Irrigation Water Quality Program funded the project. The USGS, on behalf of the NIWQP, collected extensive monitoring data to document project performance. Several years of pre- project data were compared to post-project data. Intensive biweekly sampling was done through October 2000 to ascertain the full effect of the project. Results indicate the project has been a success. Reductions of about 195 pounds/year (28%) in selenium loading and 1,980 tons/year (11%) in salt loading were reported for Montrose Arroyo. More than 90% of the load reductions were in the ground-water load. The results are published in USGS WRIR 01-4204. The USGS is continuing to collect monthly selenium and salinity data at 2 of the monitoring sites on Montrose Arroyo to document long-term effects of development in the Montrose Arroyo Basin.

### Polyacrylamide for Selenium and Salinity Remediation - Uncompahgre Valley

Polyacrylamide (PAM) is a polymer used to bind sediments and has been used extensively to reduce soil and water losses from furrow irrigation. More recently, PAM has been used as a sealant to reduce canal and lateral leakage. In the Uncompahgre Valley, demonstration projects to test the effectiveness of PAM in reducing selenium and salt loads caused by canal and lateral leakage are underway. The BOR, USGS, and Uncompahgre Valley Water Users Association are involved with the PAM demonstration projects.

One project began in March 2000 when PAM was applied to 13 miles of laterals in the Sunflower Drain basin, which drains irrigated areas in Mancos Shale east of Delta. Sunflower Drain is tributary to the Gunnison River. Estimates by USGS indicate annual loads of about 1,300 lbs/yr of selenium and 37,000 tons/yr of salt in Sunflower Drain. The USGS collected biweekly samples starting in April 2000 to monitor selenium and salt loads, which were compared to loads collected prior to 2000 at the outflow-monitoring site at Highway 92. Results for the following irrigation season (April-October, 2000) were compared to previous loading data for the same months and showed significant decreases in selenium load (24%) and salt load (13%). However, streamflow during the winter of 2000-2001 (Nov.-March) was about 26% higher in Sunflower Drain than in previous years, which resulted in higher loads compared to the pre-project years. Reasons for the large flow increase last winter are not known. In March 2001, PAM was reapplied to the 13 miles of laterals and the USGS will continue the biweekly sampling through March 2002 to further document effects of the project.

A second PAM demo study was proposed in 2001 in the Loutzenhizer Arroyo Basin, which drains high selenium and salt loading areas on the east side of the valley between Montrose and Olathe. The USGS has estimated that Loutzenhizer Arroyo discharges about 4,900 lbs/yr of selenium and about 90,000 tons/yr of salt to the Uncompahgre River. Preliminary planning indicates that PAM is to be applied in March 2002 to about 13-15 miles of canals and laterals in the Loutzenhizer Basin. The USGS initiated biweekly sampling in April 2001 at 6 sites to collect pre-project selenium and salt data. Another aspect of this study will be a cooperative effort by USGS and the Agricultural Research Service of USDA to study the movement and transport of PAM in the canals and laterals where it is applied and to the receiving drainages to address some environmental concerns about using PAM in this manner.

## Utah

### Ashley Creek Salinity Study

The four main objectives of the Ashley Creek Salinity study are: 1) Quantify change in salinity/selenium loading to Ashley Creek, 2) Investigate mobility of salinity/selenium under current hydrologic conditions, 3) Investigate mobility of salinity/selenium under hydrologic conditions after closure of the Ashley Valley Waste Lagoons (sewage lagoons), and 4) examine evaporation processes on selenium pathways. The project was started in November of 1999 and is funded cooperatively by the U.S. Bureau of Reclamation and the U.S. Geological Survey. Current work is focused on study objectives 1, 2, and 3.

Operation of the 2 gaging stations on Ashley Creek and the partial record site on River Irrigation Canal is continuing. There are now two years of streamflow and water-quality data available for the sites. Continuous water-quality parameters are not collected during the winter months to protect instrumentation from freezing conditions. To develop the relationship between salinity and the continuously measured water-quality parameter, specific conductance, about 40 water-quality samples have been collected at the 2 gaging stations, and about 10 samples were collected for the partial record site on River Irrigation Canal. The relationship between salinity and selenium, although not as straight forward, is also being investigated. Measurement of water levels at selected monitor wells surrounding the lagoons is also being done. In addition, the small streams and ditches radiating away from the lagoons are being monitored for discharge and water-quality.

In April 2001, the sewage lagoons were closed and the water treatment plant began operation. Since lagoon closure, monitoring and water-quality sampling has increased to better define the transitional period. Since lagoon closure, 1 well and 1 spring have been sampled for microbial characterization.

The most unique ground water sampled thus far comes from a seeping area located directly on the Mancos Shale and directly adjacent to Ashley Creek. The seeping area is about 1 mile upstream of the lower Ashley Creek gaging station. Total dissolved solids and selenium concentrations, on the basis of a single water-quality analysis, are 35,420 mg/L and 29,000 ug/L respectively. Nitrate as nitrogen for the same sample is 1,600 mg/L. Additional water-quality sampling is being done at this site.

### Colorado River NASQAN (National Stream-Quality Accounting Network) Program

The Colorado River NASQAN program is currently funding two stations in the lower basin of the Colorado River. Prior to FY01, the program funded eight gages, but funds have been redirected to the Yukon Basin for establishing a new NASQAN program in Alaska.

The two stations that are part of the Colorado River Basin NASQAN are:

| | |
|---|---|
| 09404200 | Colorado River above the confluence of Diamond Creek |
| 09522000 | Colorado River at the northerly international boundary |

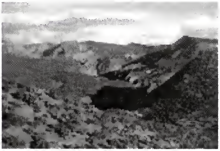
The Diamond Creek site is very important for monitoring chemical flux into Lake Mead and represents outflow from the Colorado Plateau. Chemical analysis of water includes:

Major ions
Nutrients
Trace Elements
Radionuclides (dissolved and suspended)

Chemical analysis of suspended sediment includes carbon, nitrogen, sulfate, and phosphorus, and trace elements. The samples are collected eight times a year at this site. The site at the international boundary is very important for monitoring outflow from the Colorado River into Mexico. Chemical and sediment analysis include the same constituents as the Diamond Creek gage except that radionuclides and pesticides are not analyzed. Samples are collected 6 times a year at this site. These constituents will continue to be collected and analyzed in FY02.

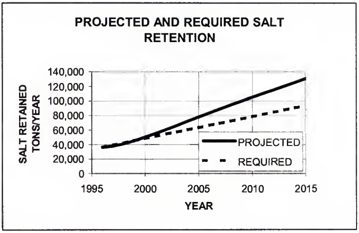
# Bureau of Land Management
# Colorado River Basin Salinity Control Program
# Accomplishments for Fiscal Year 2001

The Bureau of Land Management (BLM) is committed to its role in reducing the mobilization of salt on public lands. As in past years, the BLM undertakes this responsibility through the multitude of individual management decisions that are made within each BLM jurisdiction. While salinity is not segregated as a specific program, it is affected by almost all other land management decisions that are made. Progress in preventing salt from moving off BLM land is therefore achieved through efforts to minimize the impacts of grazing, protect riparian areas, reduce off-road vehicle impacts, conduct prescribed burns, and generally manage vegetative cover and reduce erosion.



The determination of actual impacts on Colorado River salinity from BLM projects is not possible without cost-prohibitive detailed analyses of each project. Several complicating factors including the imprecise boundaries encompassed by many management decisions, the large areas affected, and the complexity of physical and bio-geochemical effects that occur along the flow path from project area to the nearest perennial stream, render the computation of salt movement and fate nearly impossible. BLM salinity accomplishments are therefore reported in terms of salt retained by individual projects rather than salt reduction or salt savings. In reporting salt retention the BLM makes no explicit or implicit claims concerning impacts to the salinity of the Colorado River.

Significant retention of salt on BLM lands is being achieved each year. A cumulative goal of 94,000 tons of salt retention has been established for BLM to achieve by 2015. An annual target of 3,000 tons of new salt retention was established in order to meet the cumulative 2015 goal. The figure on the right compares total program accomplishments and target values through FY 2001. With



land management projects the total benefit of the projects is often not realized for several years. This maturing process is reflected in the growth of projected salt retention from existing projects shown in figure below. Even with just the existing projects BLM will exceed the 94,000-ton goal by 2015.

BLM continues to compute project cost effectiveness using the procedure agreed upon between BLM, BOR, and NRCS. This computation procedure shows an average cost effectiveness of about $6/ton for well plugging, and about $22/ton for nonpoint sources. However, for nonpoint sources there is a wide range from about $2/ton to about $70/ton.

## ARIZONA

Arizona retained about 100 tons of salt simply from the many day-to-day activities that contribute to improvement in ground cover & corresponding reduction in erosion and sedimentation.

These activities include:

- Riparian restoration including, fencing, tree planting, and tamarisk removal
- Reducing or restricting off highway vehicle access
- Road maintenance
- Bank stabilization along the Colorado River
- Grazing and range management activities including, sagebrush treatment, season of use changes, water developments, and prescribed fire.

Significant salt retention is expected from repairs to the breached Flattop Dam, however, specific calculations have not been made.

## COLORADO

Colorado reported total salt retention of about 1300 tons for FY01.

Representative actions taken in Colorado to retain salt include:

- Plugging a flowing saline well
- Thinning wild horse herds
- Reducing or restricting grazing and off highway vehicle access.
- Road maintenance, and construction and maintenance of watershed structures
- Use of prescribed fire
- Controlling the spread of tamarisk in riparian areas
- Channel and soil stabilization, primarily across the mancos shale
- Maintenance activities and construction of new sediment control structures

# NEVADA

Nevada reported total salt retention of about 66 tons for FY01.

The largest contribution was from 24 detention structures in Clark County that intercept runoff from 425,000 acres and retain about 42 tons of salt annually.

Grazing management activities, including closing allotments and non-use restrictions resulted in the retention of about 21 tons of salt.

# NEW MEXICO

New Mexico reported total salt retention of about 960 tons for FY01. Two plugged wells, the Holloway well plugged in 1994, and the Burlington Resources Well plugged in 1999 account for about 735 tons annually.

Representative actions taken in New Mexico to retain salt include:

- Riparian restoration including, fencing, tree planting, and tamarisk removal
- Reducing or restricting off highway vehicle access
- Road closures and reclamation, and road resurfacing
- Grazing and range management activities including, sagebrush treatment, season of use changes, water developments, and prescribed fire
- Plugging and abandonment of 27 oil and gas wells combined with reclamation of disturbed areas associated with these wells
- Maintenance activities and construction of new sediment control structures

# UTAH

Utah reported total salt retention of about 880 tons for FY01. Salinity control efforts were directed at implementing Best Management Practices in oil and gas field development areas, prescribed burning, improved grazing practices from changes in season of use, streambank stabilization through willow and cottonwood planting, and tamarisk control. BMP's included the proper designing and siting of well pads and access roads, improved road maintenance, and implementation of improved reclamation techniques. Land treatments included the prescribed burning of 5,500 acres in the Bookcliffs, and 1,000 acres in the Pot Creek area. Stabilization of 3 miles of stream banks began in Red Creek, through the planting of willows and cottonwoods and the control of tamarisk.

## WYOMING

Wyoming reported total salt retention of about 1,800 tons for FY01 with the largest amount coming from stabilizing the Currant Creek gully. It was estimated that a large headcut in the gully would migrate many miles upstream in the next 10-15 years. The annual production of salt from the movement of this headcut was estimated at about 570 tons per year.

The remaining contributions come from:

- Allotment management and grazing modifications
- Use restrictions
- Riparian management and restoration
- Reservoir repair
- Road maintenance
- Prescribed fire

## BLM SALT RETENTION AND COST EFFECTIVENESS ESTIMATES FOR FY 2001

| PROJECT CATEGORY | SALT RETAINED[1] IN TONS PERYEAR | COST EFFECTIVENESS[2] IN DOLLARS PER TON |
|---|---|---|
| POINT SOURCE | 1055 | 6 |
| NONPOINT SOURCE | 4023 | 25 |
| ALL PROJECTS | 5078 | 22 |

1. Salt retained is measured for point sources and estimated for nonpoint sources. The error of measurement is assumed to be 5-10%. The error of estimate is not quantifiable, but is considered to be large. By providing these estimates BLM makes no explicit or implicit assumptions about the fate of the retained salt had the project not been implemented.
2. Cost effectiveness is a weighted average. Cost effectiveness for individual projects ranges from 1.8 dollars per ton to 67 dollars per ton.

# Bureau of Reclamation
# Colorado River Basin Salinity Control Program
# Accomplishments for Fiscal Year 2001

## Salinity Modeling Studies

Colorado River Simulation System (CRSS) is used extensively by Reclamation to forecast salinity conditions and evaluate compliance with the water quality (salinity) standards. The model is undergoing a major review to calibrate the model to the post-reservoir filling period (1980-present). The filling of new reservoirs in the 1960's and 1970's greatly reduced flows in the lower reaches of the river. Without this dilution water, salinity increased until more normal flows were once again seen in the lower river. In FY01, the natural flow database was updated through 1995 and the flow portion of the model was verified against hydrologic records from the USGS. In FY02, the salinity portion of the model will be calibrated to the post-1980 era.

## Update to Economic Impacts Model

In cooperation with the Metropolitan Water District of Southern California, Reclamation has completed of a major update of its salinity impact model. The model is available in a Lotus spreadsheet format. Crop types and acreages in the model have been updated. The crop damage functions have been updated using scientific studies conducted by the USDA Salinity Research Lab in Riverside, California. Car radiator impacts have been dropped due to advances in their designs. Studies by MWD were completed on M&I impacts in southern California. These impacts were integrated into the model in 1999. Studies will continue in FY-02, in coordination with the Central Arizona Salinity Study, to improve impact estimates in Arizona.

## Salinity Control Verification Studies

Salinity control verification studies can be extremely difficult to conduct; however, they are essential to our understanding of the mechanisms of source controls. At times these studies can be both expensive and difficult to measure due to the diffuse nature of the problem. Some areas are geologically more suited to monitoring and verification.

Reclamation has commissioned a series of studies (conducted by the USGS) to evaluate the effectiveness of salinity control measures in areas where significant progress has been made in implementing salinity control practices. Water-Resources Investigations Report 95-427, *Trend Analysis of Selected Water Quality Data Associated with Salinity-Control Projects in the Grand Valley, in the Lower Gunnison River Basin, and at Meeker Dome, Western Colorado* found evidence that salinity levels in the main river channels dropped significantly in these project areas. The Meeker Dome evaluation positively concluded that the well plugging project continues to be very effective. Studies were also conducted in the Grand Valley area to further investigate the drop in salinity levels that the USGS has observed in the river by evaluating drainage water leaving the project area. A fact sheet was prepared by the USGS showing that the downward trend observed in the river was also observed in the irrigation drainage water. Studies are also underway in several of the USDA areas. The *Uintah Basin Unit Monitoring and Evaluation Study* was published in February 1998. It updated a USGS study of the Uintah Basin showing significant downward trends in the river. The USGS has completed an analysis of Reclamation's Paradox Valley Unit and published a fact sheet in FY-00. In FY-01, studies are underway with the USGS to verify the effectiveness of the Ashley Valley Sewage Lagoon Replacement Project. These studies will continue in FY-02.

**Price-San Rafael Rivers Unit, Utah**

Reclamation has a total of 7 ongoing projects in the Price-San Rafael Rivers Unit area. The projects are being funded by Reclamation's Basinwide Program and cost sharing from the Basin States. The water conservation based projects include the Ferron, Wellington, Cottonwood, Allen Projects, North Carbon, Moore, and Seeley-Collard. These projects will reduce salinity by improving the efficiency of existing irrigation projects by piping selected canals and laterals to gain pressure to run sprinkler irrigation systems. Most are nearing completion.

Project mitigation in the Price-San Rafael Rivers Unit area is a joint effort between Reclamation, the Utah Department of Wildlife (UDOW), and Utah Power and Light (UP&L). UP&L has donated riparian habitat to the Utah Division of Wildlife for the replacement of habitat losses incurred by the salinity program. In 1999, Reclamation and UDOW negotiated and signed a cooperative agreement to develop these lands for habitat replacement. UDOW will own and maintain the properties. The UDOW is working with the FWS in developing its habitat replacement plans.

**San Juan River Unit, New Mexico**

The Hammond Project was awarded a contract in late in 1996 under the Basinwide Salinity Control Program. The project will replace unlined canals and laterals, which are extremely leaky due to sandy soils. The local water district is constructing the project. Reclamation was hired by the district to design the facilities. The district awarded a contract and construction started in FY-98. The project is nearing completion.

## Dolores/McElmo Creek Unit, Colorado

The canal and lateral improvements are now complete and have been transferred to operational status. This will conclude the improvements planned for the Unit authorized by P.L. 98-569. Repayment for this unit is nearly complete. The Lower Basin Fund has been repaying expenditures in the year after they occur. The Upper Basin Fund has paid its full allocation to avoid further interest charges.

## Grand Valley Unit, Colorado

Fiscal year 1998 was the last year of construction funding for this unit. Work on the Price and Stubb Ditch laterals and habitat replacement program was completed in 1999 with about $1 million in carryover funding. This will conclude the improvements planned for the Grand Valley Unit authorized by P.L. 93-320. The remaining portion of the project may compete for funding in Reclamation's Basinwide Program under the authorities of P.L. 104-20. Reclamation and FWS are considering moving the habitat replacement lands into the FWS refuge system.

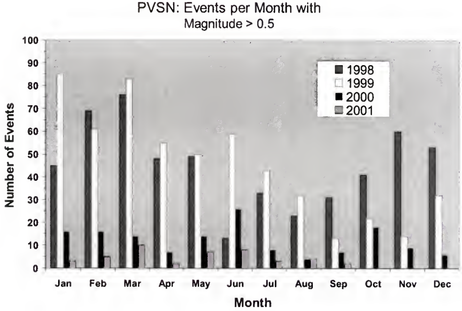
## Lower Gunnison Basin Unit, Colorado

The winter water replacement system authorized by P.L. 98-569 has been completed. The Lower Basin Fund has been repaying expenditures in the year after they occur. The Upper Basin Fund has paid its full allocation to avoid further interest charges.

The remaining portion of the project, the East Side Lateral portion, will compete for funding in Reclamation's Basinwide Program under the authorities of P.L. 104-20. In 1998, a demonstration project was found to be competitive and was accepted into the Basinwide Program. The project costs are shared between the Department of the Interior's irrigation drainage (selenium) program funds and the salinity program. The purpose of the demonstration project is to evaluate the effectiveness of salinity control measures to control selenium. If it can be demonstrated that salinity control methods are effective at controlling selenium pickup, other joint projects may be proposed. A preliminary analysis by the BOR finds that lateral lining has reduced both salt and selenium levels in the return flows to the river by an average of 2,520 tons/year of salt and 210 pounds/year of selenium. With cost sharing from the NIWQP, actual contract costs for the salinity portion of the project ($18/ton) were below those bid for the project, significantly improving the cost effectiveness of the project. Even without NIWQP cost sharing, the cost effectiveness of the project would have been $33 per ton.

**Paradox Valley Unit, Colorado**

This project intercepts extremely saline brines before they reach the river and then disposes of the brine by deep well injection (16,000 ft well). In fiscal year 2000, the Paradox Valley Seismic Network (PVSN) showed activity at the injection site reached levels and frequencies that were unacceptably high. Restricting the maximum injection rate to 230 gpm in July 2000 has reduced seismic activity, but has also reduced the effectiveness of the injection facility to about 76,000 tons per year.



Reclamation continues to blend fresh water into the brine to prevent sulfate precipitation in the injection well this fall, but later this year will begin a test to inject 100 percent brine. Temperature logs of the well show that the area around the well bore and injection zone have cooled sufficiently to prevent precipitation problems near the well bore. Reclamation will be carefully monitoring injection pressures for buildups that might suggest plugging of the aquifer near the well bore.

**Uinta Basin Unit, Utah**

Reclamation has a total of 9 projects in the Uinta Basin Unit area. The projects are funded jointly by Reclamation's Basinwide Program and cost sharing from the Basin States. The water conservation based projects include the Burns Bench, BIA-Ute Tribe, Duchesne County, Farnsworth, Lower Brush Creek, Ouray Park, and Western Uintah projects. These projects will reduce salinity by improving the efficiency of existing irrigation projects. Several will pipe selected canals and laterals to gain pressure to run high-efficiency sprinkler irrigation systems.

**Basinwide Salinity Program Overview (P.L. 104-20)**

In July 1995, Public Law 104-20 was signed into law. It authorizes the Secretary to implement a basinwide salinity control program, directs the Secretary to prepare a planning report on the new program, and authorized $75,000,000 to be appropriated. Additional authority was provided in November 2000, which increased the appropriation ceiling to $175,000,000. With cost sharing, the Program has authority to expend up to $250 million within the Basin.

# Summary Data
# Colorado River Basin Salinity Control Program

## Salinity Program Cost Sharing

Table A-1 includes a summary of the Basin Fund cost sharing. The Advisory Council discussed the allocation between the basin funds last year and retained the 85/15 allocation between the lower and upper basin funds. Reclamation used this allocation for its repayment/cost sharing computations under section 205 of the Salinity Control Act.

## Cost Effectiveness

Cost effectiveness ($/ton) is computed by annualizing the program's capital expenditures at the planning interest rate over the projected life of the project. Annual program costs for O&M (if any) are added to the annualized capital cost and divided by the annual tons reduction. For USDA improvements, a 25-year life was assumed. For the old Reclamation projects, a 50-year life was assumed. For the new Basinwide Program, a 25-year life was assumed though the actual life may be much longer.

Tables A-2, 3, and 4 list expenditures, salt load reductions, and cost effectiveness for the Salinity Program. For the USDA program, cost effectiveness is computed based on past expenditures and salt load reductions.

### Table A-1
### Basin States Costs Sharing Program Obligations

| Program | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|
| WY Farm Assistance | $0 | $50,700 | $102,857 | $76,012 | $208,241 | $210,489 |
| WY Technical Assistance | $0 | $21,729 | $68,572 | $50,675 | $105,716 | $60,325 |
| UT Farm Assistance | $0 | $390,000 | $239,143 | $439,310 | $771,828 | $944,757 |
| UT Technical Assistance | $0 | $167,143 | $159,428 | $292,874 | $355,662 | $402,840 |
| CO Farm Assistance | $0 | $480,000 | $414,428 | $604,487 | $497,211 | $530,066 |
| CO Technical Assistance | $0 | $205,714 | $276,286 | $402,991 | $331,474 | $330,710 |
| USBR O&M (estimate) | $0 | $0 | $0 | $1,200,000 | $1,200,000 | $1,200,000 |
| USBR Basinwide | $214,286 | $2,142,857 | $3,257,143 | $5,357,143 | $5,143,000 | $4,639,714 |

Note: FY-2001 yearend balance in Lower Basin Development Fund is $31,822,197.72

## Table A-2
## Reclamation's Basinwide Salinity Control Program Summary (P.L. 104-20)

| Unit/Project | Method | BOR portion of Controls (tons/yr) | Proposed Total Controls (tons/yr) | Uniform Cost Effectiveness 6.375% 25yr |
|---|---|---:|---:|---:|
| Hammond | Canal Lining | 48,130 | 48,130 | $22 |
| Uncompahgre Demo | Pipe Lateral | 2,295 | 2,295 | $31 |
| Ashley | Sewage Lagoon | 9,000 | 9,000 | $29 |
| | **PRICE-SAN RAFAEL UNIT** | | | |
| Allen Lateral | Combined System | 2,031 | 8,125 | $33 |
| North Carbon | Combined System | 1,921 | 7,684 | $44 |
| Cottonwood | Winter Water | 8,506 | 8,506 | $20 |
| Ferrron | Combined System | 11,852 | 47,407 | $29 |
| Seeley-Collard | Combined System | 226 | 905 | $26 |
| Moore Group | Combined System | 4,397 | 17,587 | $31 |
| Wellington | Combined System | 17,688 | 17,688 | $22 |
| | **UINTA BASIN UNIT** | | | |
| Burns Bench | Combined System | 6,675 | 21,468 | $24 |
| BIA - Ute Tribe | Line & Combined System | 50,306 | 53,344 | $30 |
| Duchesne County | Pipe Canals | 20,417 | 20,417 | $36 |
| Farnsworth | Pipe Canals | 9,557 | 9,557 | $28 |
| L. Brush Cr. (Sunshine) | Combined System | 721 | 2,763 | $33 |
| Western Uintah | Combined System | 16,205 | 25,780 | $18 |
| | **2001 RFP PROJECTS** | | | |
| Duchesne Irr Co-S Canal | Pipe Canal | 1,250 | 1,250 | $20 |
| River Canal | Pipe Canal | 4,060 | 4,060 | $25 |
| Union Canal | Pipe Canal | 5,255 | 5,255 | $25 |
| Uintah Basin Irr Co | Pipe Canal | 3,578 | 3,578 | $25 |
| Dry Gulch E | Pipe Canal and Lateral | 12,973 | 12,973 | $25 |
| Dry Gulch C | Pipe Laterals | 15,324 | 15,324 | $25 |
| Tropic & East Fork | Pipe Canal | 3,100 | 3,100 | $28 |
| Lawrence South | Pipe C + USDA Sprinkler | 1,304 | 5,217 | $29 |
| Ouray Park Irr Co | Pipe Canal | 10,131 | 10,131 | $29 |
| Duchesne WCD | Pipe C +possible Sprinkler | 42,800 | 42,800 | $30 |
| | Total | 309,702 | 404,344 | $27 |

## Table A-3
## Reclamation Salinity Control Unit Summary (P.L. 93-320 and 98-569 Units)

| Unit/Study | Implementation | Controls (tons/yr) | Reclamation Capital Cost | Annual O&M Costs | Cost per Ton |
|---|---|---|---|---|---|
| Meeker Dome | 1980-1983 | 48,000 | $3,100,000 | $0 | $4 |
| Las Vegas Wash | 1978-1985 | 3,800 | $1,757,000 | $50,000 | $45 |
| Grand Valley | 1980-1998 | 127,500 | $160,900,000 | $1,189,000 | $96 |
| Paradox Valley | 1988-1996 | 76,000 | $67,400,000 | $2,700,000 | $97 |
| Dolores Project | 1990-1996 | 23,000 | $44,700,000 | $33,000 | $136 |
| Lower Gunnison | 1991-1995 | 41,380 | $24,000,000 | $456,000 | $51 |
| Total | | 319,680 | $301,857,000 | $4,428,000 | $79 |

Note: Cost per ton based on amortization over 50 years at 6.625 percent interest.

## Table A-4
## USDA Salinity Control Unit Summary

| Unit | Controls thru FY00 (tons/yr) | Potential Salt Removal (tons/yr) | Cost thru FY00 | Projected Total Cost | Cost per Ton |
|---|---|---|---|---|---|
| McElmo Creek | 16,443 | 46,000 | 9,746 | 28,401 | 49 |
| Uinta Basin | 97,550 | 106,800 | 51,094 | 55,539 | 44 |
| Lower Gunnison | 60,097 | 166,000 | 29,336 | 88,730 | 40 |
| Grand Valley | 83,271 | 132,000 | 38,285 | 60,689 | 38 |
| Big Sandy River | 35,245 | 52,900 | 11,529 | 17,304 | 27 |
| [3]Price-San Rafael | 8,561 | 120,220 | 1,975 | 27,734 | 19 |
| TOTALS | 301,167 | 623,920 | 141,965 | 278,397 | 39 |

Notes: Cost per ton based on amortization over 25 years at 6.625 percent interest. Projected total costs were estimated using by ratio of existing costs and ton to potential tons.

## Table A-5
## BLM Salinity Control Unit Summary

| Activity | Implementation | Salt Removed thru FY01 (tons/yr) | Potential Salt Retention (tons/yr) | Cost effectiveness ($/ton) |
|---|---|---|---|---|
| Well Plugging | 1980-2015 | 12,400 | 14,800 | 6 |
| Nonpoint Sources | 1991-2015 | 50,600 | 79,200 | 25 |
| Totals | | 63,000 | 94,000 | 22 |